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Competitive and responsible? The relationship between corporate social and financial performance in the energy sector

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ABSTRACT

Our key research objective in this study is to examine whether investments in corporate social responsibility (CSR) have an effect on corporate financial performance (CFP), or vice versa. The context is the energy industry, in which sustainability issues are of vital importance. Our data set is compiled from the KLD database and Thomson ONE. We use panel data on energy-sector companies covering the years 1991 and 2009 in order to assess Granger causality between CSR strengths/concerns and CFP. We consider strengths and concerns separately, and use both accounting and market-based measures of CFP. Our findings indicate differing impacts on financial performance: CSR concerns Granger-cause both profitability and market value whereas CSR strengths seem only to Granger-cause market value. These effects appear after different delays. Furthermore, as CFP does not seem to Granger-cause CSP in most of the model specifications, our results do not support bidirectional causality between CSP and CFP.

Contents

1. Introduction

The increasing global awareness of sustainability issues and corporate social responsibility (CSR) is requiring organizations to include CSR practices and principles in their business strategies. It has been argued that failure to do so could result in a loss of business opportunities and competitive advantage [1,3]. The

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relationship between firms' financial performance and CSR efforts has attracted increasing interest in recent years. Most studies on CSR compare the financial performance of socially responsible companies with the performance of firms that do not meet the same CSR criteria (e.g., [3–6]). Although there is very little evidence of a negative linkage, the relationship remains rather unsettled (e.g., [7,9]). Furthermore, many of the existing studies do not take time and context dependence into account. On the basis of previous research, therefore, it is difficult to ascertain whether CSR investments have a positive influence on performance, or if financially successful companies have just been investing more proactively in CSR [10].

Our key research objective was to find out whether investments in CSR have an effect on financial performance, or vice versa, within the energy industry. By its very nature the energy sector plays a crucial role in sustainable development (see e.g., Omer [11]) and is also a forerunner in CSR-related issues (see e.g., Hughey and Sulkowski [12]). Despite this, however, previous studies on the relationship between CSR investments and financial performance in the sector are scarce.

We constructed our data set from the KLD database (CSR-related variables) and Thomson ONE (financial information). Our panel data covers the years 1991 and 2009. We collected information on 14 companies in the energy sector in order to examine Granger causality between CSR and corporate financial performance (CFP). Granger causality has been used previously to investigate this relationship (e.g., [13–16]). However, our results make a valuable contribution to this literature given the longer time dimension than in most of the earlier studies. Moreover, we treat CSR strengths and concerns from the KLD database as distinct constructs.

The paper is organized as follows. We begin by reviewing the previous literature on CSR and CFP, and consider CSR in the context of the energy sector. The next section describes the data and methodology we used, and Section 3 presents the empirical results. In the final section we summarize and discuss the findings, and draw conclusions.

2. Theoretical background

2.1. CSR and profitability

By definition, CSR is "a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis" [17] (p. 6). The level or practice of CSR in a given firm is reflected in its corporate social performance (CSP), defined as "a business organization's configuration of principles of social responsibility, processes of social responsiveness, and policies, programs, and observable outcomes as they relate to the firm's societal relationships" [18] (p. 693). Hence, in this study we conceptualize CSP as the manifestation of CSR.

The purpose of a profit-making organization is to maintain or increase the wealth of its owners in the long run. Therefore, it is legitimate to ask why business organizations would invest in voluntary actions that have other purposes (in this case, CSR) if it were not the case that what is good for society is not necessarily bad for business. It may be that, as Davis [19] (p. 313) writes: *"The firm which is most sensitive to its community needs will as a result have a better community in which to conduct its business"*. Given that (according to the definition) CSR is so comprehensively related to the firm's actions, achieving good CSP is likely to require critical assessment of its principles and practices, as well as communication with various stakeholder groups. Such an activity may reveal opportunities for cost savings, in the form of waste reduction for example, or by enhancing the understanding of the business environment and decreasing the risk of conflict. Therefore, although investing in CSR does not necessarily mean investing in the firm's core business, and in some cases it is just a cost, it may be a source of financial benefit.

The literature describes various ways in which CSR investments can influence a firm's financial performance. It has been suggested, for example, that they may have a positive effect on its resources and capabilities, or its managerial competence. They may also have positive reputational impacts, which could decrease operational costs in terms of reducing the amount of waste, decreasing the risks, or positively influencing employee commitment and productivity (for various possible links, see e.g., Orlitzky and Schmidt [9], Aguinis and Glavas [20], Russo and Fouts [21], and Weber [22]). There is recent empirical evidence of a positive impact on operational costs. El Ghoul et al. [23], for example, found that better CSP lowers the cost of equity capital, and Greening and Turban [24] that it attracts prospective job applicants. CSR investments may also create goodwill towards the firm, attenuating reactions in case of a negative event [25], and enhanced CSP could be connected with customer satisfaction [14]. However, according to a recent review, consumers' appreciation of higher CSP may be reflected in a firm's corporate reputation or brand image and not so much in the *"manner that is directly reflected in the company's "bottom line"."* [26] (p. 32) Thus, it may be difficult for a firm to set a price premium on responsibly produced products. Furthermore, markets may differ greatly in how well consumers are informed about the qualities of the product and issues related to its production, as well as in customers' willingness to pay for responsible production. For instance, despite its higher price, the demand for organic food has increased, and the demand for fair trade products has also been growing in recent years. These aspects may indicate an increasing awareness of or need to reflect on values in people's buying behavior, and the future will show how extensively this phenomenon will spread to different industries and businesses.

It may also be that the competitive advantage gained through CSR investments is temporary at best. At some point, when the so-called "low hanging fruit" has been picked, a certain level of CSP may become standard in an industry, and firms would need to take a more proactive stance towards CSR in order to be better than average (see e.g., Russo and Fouts [21] and Sharma and Vredenburg [27] for a discussion). At the point when it is no longer a question of relatively quickly reachable benefits, such as cost savings, but one of the long-term commitments with due risk, it may be more difficult to justify CSR investments to shareholders.

However, according to the accumulated empirical evidence, good CSR practices seem to improve CFP (for reviews see e.g., Margolis and Walsh [7], Orlitzky et al. [9], and van Beurden and Gossling [28]). On the other hand, Surroca et al. [29] report an indirect relationship that depends on the firm's intangible resources, whereas Barnett and Salomon [30] found evidence of a curvilinear relationship. There is also some empirical evidence [31,32] that good CSP is connected with better CFP, implying that CFP precedes CSP. These findings lend support to the so-called slack resources theory, according to which a financially well performing firm is in a better position to invest in CSR. Given that, according to the results of Waddock and Graves [32], the causation between CSP and CFP may run in both directions, the authors speculate further on the possibility of a "virtuous circle" formed by a simultaneous and interactive impact.

A number of methodological issues burden the accumulated research. For instance, the validity of the measures has been questioned, as has the omission of adequate control variables (e.g., [7]). It has also been suggested that the context specificity of CSR should be taken better into account, such as by using single

Table 1
An overview of empirical CSR studies in the energy sector.

Study	Main objective	Sample	Analysis	Major findings
Hughey and Sulkowski [12]	Tests whether greater data availability leads to a better CSR reputation and performance	45 firms from the global oil and gas extraction industry	Regression analysis	Having more data available results in at least a better CSR reputation
Sharratt et al. [38]	Examines the relationship between social responsibility and regulation, and how social responsibilities are construed by firms	12 utility companies in the UK energy-supply industry	Semi-structured interviews	Suggests 4 templates for understanding the relationship
Pätäri et al. [40]	Explores the relation between CSR-related activities and financial performance	210 firms from the global energy industry	Statistical analyses	Finds evidence of a positive association between sustainable development and
Ekatah et al. [41]	Examines the link between CSR and profitability	Royal Dutch Shell Plc	Case study; statistical trend analysis	CSR is positively related to better financial performance
Jindrichovska and Purcărea [42]	Analyzes the development of CSR, with special emphasis on environmental issues	Comparison between the Czech Republic and Romania	Case studies	Standards of CSR and environmental reporting are based on the same principles, but the particular approaches differ
Bolton et al. [43]	Tracks CSR as an organizational process	A large multinational energy company	Case study combined with stakeholder interviews	Employee involvement grows from a minor element to a vital contributory factor in CSR success
Mobus [44]	Examines whether the voluntary nature of CSR is sufficient to deliver on the promise of greater corporate transparency	BP plc	Reports and news related to a crisis event	CSR reports do address issues and concerns that society harbors with respect to corporate behavior and impact, particularly during crisis events
Trapp [45]	Examines and evaluates the strategies used in the CSR campaign	Vattenfall	Descriptive case study	Proposes ways of ensuring greater credibility in similar cases
Schultz and Wehmeier [46]	Develops a general understanding of the institutionalization of CSR on the societal and the organizational level	Vattenfall Europe AG	Illustrative case; analysis of corporate and media articles and an interview	Develops a general, theoretical framework for institutionalization processes
Syrjälä and Takala [47]	Describes and explains certain observations concerning CSR from the personnel standpoint	2 Nordic energy-sector companies in a merger process	Interviews	The positions of the stakeholder groups change in a merger process

industry samples in CSP-CFP studies (e.g., [28,33]). With its focus on the CSP-CFP link in the energy sector the present study responds to this call.

2.2. CSR in the energy sector

Sustainability in the energy sector is about finding energy sources that have minimal environmental impact and, on the social level ensuring access to reliable and affordable energy supplies. In the short term, however, there is likely to be a conflict between these two long-term objectives [34,35]. There are many country-level indicators assessing sustainable development in the energy industry, one of them being Energy Indicators for Sustainable Development (EISD) [36]. Another set of indicators, Sustainable Energy Watch (SEW) developed by Helio International, includes four sustainability dimensions (environmental, social, economic, and technological), and relates to the level of emissions, investments in clean energy, the proportion of households with access to electricity, and the use of renewable energy, for example [35].

On the firm level, CSR could be described as an overarching phenomenon that affects how business is conducted, and covers employment and environmental issues and local community-development projects [37,38]. There are also many standards, guidelines and conventions that energy companies are expected to follow in order to gain the essential trust of their key stakeholders [39]. However, CSR is perhaps the most clearly visible through sustainability reporting, energy-industry companies being among the early adopters [12]. Thus, it is no longer an option for an energy company to focus only on deriving value for its shareholders: it must be both profitable and responsible at the same time [39]. Streimikiene et al. [39] (p. 814) express this well: *"CSR is one of the most complex challenges facing businesses today… [It] must be "managed" by the energy company in order to maintain its "license to operate"."* Challenges of managing and implementing CSR in the energy industry are many and various, and include the overall cost, a lack of information and awareness, insufficient human resources, weak co-operation with stakeholders, failure to involve the beneficiaries and to integrate CSR initiatives into larger development plans, and an excessive focus on technical and managerial solutions. Moreover, the high price of energy in relation to a low average income reduces the willingness to pay an even higher price for green energy [37,39].

There is a wide array of studies focusing on CSR in the context of the energy industry (see Table 1 for an overview of empirical work). However, studies examining the CSP-CFP link among energy companies are scarce, and we found only two: Pätäri et al. [40] analyzed 210 energy companies worldwide and found evidence of a positive association between sustainable development and the firms' financial performance, especially when performance was measured as the market-capitalization value. Second, Ekatah et al. [41] used a case-study approach and their results also indicated that socially responsible corporate performance could be associated with profitability.

All in all, the case-study approach is commonly taken. Jindrichovska and Purcărea [42] compared CSR reporting practices in large Czech and Romanian enterprises, and their study also included case studies within two energy-sector companies. Bolton et al. [43] in their case study within a large multinational energy company highlighted CSR as a dynamic internal organizational process, and identified a relationship between CSR policies and employees. Mobus [44], in turn, examined the value and relevance of CSR reporting and whether it was sufficient to deliver on the promise of greater corporate transparency within a multinational energy company. In addition to these, there are relatively many studies utilizing data drawn from one of Europe's leading energy companies, Vattenfall: Trapp [45] studied the CSR campaign of the Swedish Vattenfall, Schultz and Wehmeier [46] illustrated their analysis of CSR institutionalization within corporate communications in the case of Vattenfall Europe AG, and Syrjälä and Takala [47]

analyzed employees' views on CSR in a merger process between Vattenfall Finland and Suomen Voimatekniikka.

Sharratt et al. [38] and Hughey and Sulkowski [12] relied instead on larger samples. Sharratt et al. [38] analyze how regulatory demands for social responsibility are negotiated and influenced in an empirical study of 12 utility companies. Hughey and Sulkowski [12], in turn, identified 45 firms from the global oil and gas extraction industry with extremely good and bad reputations, and examined whether better data availability about companies led to better CSR performance ratings. Their findings reflect the saying that *"any publicity is good publicity."* Naturally, there are also studies examining sustainability in the energy sector, and the role of energy in sustainable development in different regions and countries [34–36,48,54], but these studies are not included in Table 1.

In sum, although existing studies consider CSR in the energy-industry context from many different perspectives, and despite its general importance in the energy sector, the CSP-CFP link is clearly under-represented in this context. Moreover, it could be concluded from the studies examining this link that it is difficult to establish whether CSP has affected CFP, or whether otherwise financially successful companies have just been more proactive in the sustainability area. Our aim is thus to narrow this research gap. In the next section we describe our research design and examine empirically whether investments in CSR have an effect on financial performance, or vice versa.

3. Empirical analysis

3.1. Methodology

We used the Granger causality test [55,56] to examine the relationship between CSP and CFP. The method has been used previously in this context (e.g., [13–16]). The basic idea behind Granger causality is that a variable X can be said to Granger-cause another variable Y if the past values of X help to explain Y even after the impact of Y's past (i.e., lagged) values is taken into account. Further, if X Granger-causes Y, changes in X should precede changes in Y. However, as this definition implies, Granger causality cannot be used to predict whether a rise in X (or, respectively, Y) increases or decreases Y (or X). Moreover, Granger causality presupposes time series data, although Granger causality tests are being used increasingly nowadays with panel data as well.

In practice, the test for bilateral causality can be performed in accordance with the following equations:

$$Y_t = \alpha_0 + \sum_{j=1}^{n} \alpha_j Y_{t-j} + \sum_{k=1}^{n} \beta_k X_{t-k} + e_{1t} \tag{1}$$

$$X_t = \gamma_0 + \sum_{j=1}^{n} \gamma_j Y_{t-j} + \sum_{k=1}^{n} \delta_k X_{t-k} + e_{2t} \tag{2}$$

where e_{1t} and e_{2t} are assumed to be uncorrelated.

X is said to Granger-cause Y if the estimated coefficients of the lagged values of X in Eq. (1) are statistically significantly different from zero as a group (the F-test of the joint null hypothesis $\beta_1 = 0, \ldots, \beta_n = 0$ can be used to see if this is the case) and, respectively, Y is said to Granger-cause X if the estimated coefficients of the lagged values of Y in Eq. (2) are statistically significantly different from zero as a group. Causality may be (1) unidirectional from X to Y or Y to X, (2) bilateral from X to Y and from Y to X, or (3) the variables may be independent [57] (pp. 652–657). In practice, bilateral causality is quite common.

Control variables can be added into Eqs. (1) and (2). These are variables that are expected to impact the dependent variable. It is important to test Granger causality on a fully specified model in order to avoid spurious relationships.

Granger causality can be examined only between stationary variables (or co-integrated variables see Kennedy [58], p. 313). It is therefore necessary to begin by testing whether or not the variables of interest are stationary.

The number of lags ($=n$ in Eqs. (1) and (2)) to be included in the Granger causality equations is also an important practical question that can affect the results on causality. Akaike or Bayesian information criteria, for example, can be used to determine the number of lags. It may also be possible to deduce the maximum number of lags that can be reasonably expected to have an impact theoretically, but sometimes data availability restricts the number of lags that can be included in the analysis (see Nelling and Webb [15]).

The use of the lagged values of the dependent variable as explanatory variables may result in autocorrelation, and it is important to test whether it is a problem and to react accordingly. This is something that many earlier studies (such as Agarwal and Berens [13]) seem to ignore.

The use of panel data facilitates control for unobservable characteristics that are constant over time but differ between firms. In general, panel data models have become increasingly popular because they make it possible not only to account for individual differences (i.e. heterogeneity) but also to analyze more complicated connections. The history of Granger causality testing is shorter with panel data than with time series data, and in fact can have different manifestations. Here we follow the assumptions in the strand of the literature initiated by Holtz-Eakin et al. [59,60] that the coefficients of the explanatory variables are the same for all cross-sectional units (companies in this case), and that there is no causal variation among the cross-sections. Hartwig [61] and Podrecca and Garmeci [62], for example, took this approach, whereas Lev et al. [14] and Nelling and Webb [15] apply the method in the context of CSP and CFP.

3.2. Data

We used panel data on 14 energy-sector companies from the years 1991 and 2009 in order to examine the Granger causality between CSP and CFP. Although the sample would have been too small for cross-sectional data, it is adequate with panel data. We obtained our sample of 14 energy companies as follows. First, we identified all the energy firms from the 1991 data from their Standard Industrial Classification (SIC) codes and business descriptions, and the company websites. We then compared these energy firms to those in the 2009 data, and the firms that also featured in the 2009 data were included in the final sample. If only the name of the company had changed during the research period it was included the final data set, but if mergers and/or acquisitions had taken place it was excluded from the final sample. Restructuring is common in the energy industry, and the final sample was narrowed down to 14 companies. The four-digit SIC codes of these companies were 1311, 1381, 2911, 4911, 4922, 4923, 4924, and 4931. Due to its nature the energy sector plays a crucial role in sustainable development, and it is also a forerunner in CSR-related issues (e.g., [12,35,39,54]). It was for these reasons that we chose to focus on energy companies in our study.

Our data comprises a balanced panel because some of the methods used in the empirical part of the study require that. Our time dimension is longer than in most previous studies, which might show as different results in comparison to those of earlier research.

We used the ratings provided by MSCI ESG Research, formerly KLD Research & Analytics, Inc., to measure CSP. Agarwal and Berens [13], Nelling and Webb [15], Scholtens [16], McGuire

et al. [31], and Waddock and Graves [32] are among those who have used these ratings in previous CSP research. The dimensions of CSR strengths and concerns covered in the database include seven major qualitative areas: the community, corporate governance, diversity, employee relations, the environment, human rights, and the product,[1] and each one comprises various subcategories. Strengths include actions the company is taking that may have a positive impact on society, whereas concerns are aspects that might harm society in some sense. Unlike many previous studies, we treat CSR strengths and concerns as distinct constructs. This is in accordance with Mattingly and Berman's [63] suggestion concerning the KLD data, that positive and negative social actions are distinct constructs (see also McGuire et al. [64]). In order to obtain an overall score for CSR strengths we summed the total numbers of strengths related to the community, corporate governance, diversity, employee relations, the environment and the product. In addition to these categories, the total number of CSR concerns included those related to human rights. The total number of human-rights-related strengths was not available for our whole period and was thus excluded from the analysis.

The financial data comes from the Thomson ONE database. We used return on assets (ROA) as an accounting-based performance measure: Makni et al. [65] and Nelling and Webb [15], for example, have used it to measure CFP. Our market-based measure of financial performance was market capitalization, which features in the earlier literature [16]. We used both accounting and market-based measures in order to avoid one-sidedness and to analyze firm performance from different perspectives.

Table A.1 in the Appendix presents the summary statistics for the variables used in the analysis, and Table A.2 shows the correlations between the variables. The reason for showing the correlations here is to describe the data and the co-variation between the variables rather than to reveal causality. Description of the sample companies can be found in Table B.1 in the Appendix.

4. Results

4.1. The framework

In our case of CSP and CFP (and with the panel data), the Granger causality test equations are as follows:

$$CSP_{it}=\alpha_0+\sum_{j=1}^{6}\alpha_j CSP_{i,t-j}+\sum_{k=1}^{6}\beta_k CFP_{i,t-k}+\mu_i+e_{1it} \quad (3)$$

$$CFP_{it}=\gamma_0+\sum_{j=1}^{6}\gamma_j CSP_{i,t-j}+\sum_{k=1}^{6}\delta_k CFP_{i,t-k}+\lambda_i+e_{2it} \quad (4)$$

here i indexes the company and t time. The equations now include company-specific effects μ and λ, which could be considered either fixed or random, depending on the estimation method. The maximum number of lags in our equations is six. We differ here from Nelling and Webb [15], who include the non-lagged value of the independent variable. This is likely to lead to reverse causality. Moreover, Granger causality is about precedence in time rather than contemporaneous correlations.

4.2. Stationarity

As mentioned above, Granger causality presupposes stationarity. We therefore had to test our CSP and CFP series for unit roots. Many such tests have been developed for panel data (e.g., [66,67] Fisher-type tests), but because they are based on different sets of assumptions, the results may vary. We therefore report the results of four tests for robustness, for which we used Stata 11 software: Hartwig [61] used the same set of tests.

Table A.3 shows the results of the panel unit-root tests with and without trend. We used the Bayesian information criterion to determine the number of lagged terms included in the test equation, together with the test statistics of Levin, Lin and Chu Adjusted t* and Im, Pesaran and Shin W-stat, and adjusted the number of lags in the Fisher-type unit-root test accordingly.

The results imply that changes in CSR strengths and concerns, ROA and market capitalization are all stationary. We were therefore able to apply Granger causality tests to the series in order to analyze the relationship between CSP and CFP.

4.3. Granger causality

In tests for Granger causality, autocorrelation will lead to incorrect test statistics if the number of lags included in the equations is too low. However, too many lags will reduce the power of the test. Because autocorrelation seemed to be a problem in our Granger causality equations, even with six lags (the results are available upon request from the authors), we corrected for it and report the generalized least squares (GLS) estimation results in Tables A.4–A.7.[2]

Tables A.4 and A.5 concern ROA, our accounting-based measure of CFP. According to the results, changes in ROA do not Granger-cause changes in the total number of CSR strengths (Panel A) or concerns (Panel B). These results are robust to the use of return on invested capital (ROIC) as the measure of CFP instead of ROA (the results are available upon request). As Nelling and Webb [15] conclude, CSP seems to derive from unobservable characteristics of companies rather than their financial performance. Thus, in contrast to earlier studies supporting the notion of a "virtuous circle" between CSP and CFP (e.g., [32,68]), our results do not support the existence of bidirectional causality. There are many possible explanations for this. First, we did not combine CSR strengths and concerns as was done in some previous studies, and this might have affected the results. Second, our time series is longer than in most of the earlier studies. Even if the longer time dimension allowed us to include a larger number of lags in the equations, it is also possible that the relationship between CSP and CFP changed over time, which is something that Granger causality could not capture. Third, it is possible that the relation between CSP and CFP appears weaker when panel Granger testing is used. For example, our results are completely in line with those of Agarwal and Berens [13], who also found in their panel data estimations that CFP did not Granger-cause CSP (see also Nelling and Webb [15]).

With regard to the causality from CSP to CFP, changes in CSR strengths do not seem to Granger-cause changes in ROA (or ROIC, the results are available upon request), either. Instead, changes in CSR concerns seem to Granger-cause CFP changes at the five-percent significance level if the number of lags included in the equation is four or higher. Thus, CSR concerns seem to have an impact on ROA, but with a delay. The latter result is again in line with the findings of Agarwal and Berens [13] that CSP seems to Granger-cause CFP.

Tables A.6 and A.7 present the results for our market-based measure of CFP, i.e. market capitalization. As Table A.6 shows, changes in market capitalization do not seem to Granger-cause changes in CSR strengths or concerns either. Instead, there is strong evidence that changes in the total number of CSR strengths Granger-cause changes in market capitalization, and the impact is visible with all lags from one to six at the five-percent significance level. In addition, changes in

[1] In addition, the database includes various controversial business issues that are not included in our analysis. Scholtens [16] describes the KLD social issue ratings in detail.

[2] Lev et al. [14] also use GLS to address the autocorrelation problem.

Table 2
Granger-causality results with GLS and FE, and without and with net sales.

Causality being tested	Specification			
	(1) GLS	(2)GLS+net sales	(3) FE (robust)	(4)FE (robust)+net sales
ROA→CSR+	No	No	No	No
ROA→CSR−	No	No	Yes***, lag 6	Yes**, lag 5 & lag 6
CSR+→ROA	No	No	No	No
CSR−→ROA	Yes**, lag 4→	Yes**, lag 4→	Yes*, lag 3 & lag 5 →	Yes*, lag 3 & lag 5 →
MC→CSR+	No	No	Yes*, lag 2 & lag 4 →	Yes*, lag 2 →
MC→CSR−	No	No	Yes*, lag 5 →	Yes**, lag 4 →
CSR+→MC	Yes**, lag 1→	Yes**, lag 1→	Yes*, lag 1 & lag 3 →	Yes*, lags 1, 3 & 4
CSR−→MC	Yes**, lag 4→	Yes**, lag 4→	Yes**, lag 5 →	Yes*, lag 5 →

Notes: ROA=return on assets, CSR+=CSR strengths, CSR−=CSR concerns, MC=market capitalization.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%

CSR concerns seem to Granger-cause changes in market capitalization, but again with a delay of four lags. It therefore seems to be the case that market capitalization reacts more quickly to changes in CSR strengths than to changes in CSR concerns.

To summarize, CFP does not seem to Granger-cause CSP. Instead, there is evidence that changes in the total number of CSR concerns have an impact on ROA and market capitalization, whereas changes in CSR strengths seem only to affect market capitalization.

4.4. Robustness checks

As mentioned above, control variables should be included in the analysis if there is reason to believe that they might play a role. Therefore, like Makni et al. [65] and Nelling and Webb [15], we controlled for the size of the company, adding (the natural logarithm) of net sales as an explanatory variable in Eqs. (3) and (4).

We also ran fixed effects (FE) estimations without and with net sales as a control variable because the FE estimator is consistent in many situations, whereas GLS estimators may be biased (although autocorrelation reduced the reliability of our FE estimations).

The results of the robustness checks are summarized in Table 2. The first column shows the relationship under analysis, such as whether changes in ROA Granger-cause changes in CSR strengths in the case of "ROA→CSR+". The second column depicts the main results discussed above for comparison, the third the results with the same estimation method (GLS) but with net sales as a control variable, the fourth the results from the FE estimations and, finally, the fifth the results of the FE estimations with net sales as a control variable.

The main implications are robust to the inclusion of net sales as a control variable and the change in estimation method. First, it is evident that ROA does not Granger-cause CSR strengths, nor do CSR strengths Granger-cause ROA. Thus, the variables seem to be independent. Second, there is hardly any evidence that ROA might Granger-cause CSR concerns, whereas the evidence that CSR concerns Granger-cause ROA but with a delay is very strong.

With market capitalization as the measure of CFP the most robust results are that CSR strengths Granger-cause capitalization starting from the Granger equations with only one lag, and that CSR concerns Granger-cause it but with a delay of four or five lags. The evidence on the reverse causality from market capitalization to CSR is contradictory, making it difficult to draw any conclusions about the significance of this relationship.

5. Discussion

The main findings of this study are as follows: (1) CSR strengths and concerns have differing effects on the firm's financial performance; (2) the effect depends on the performance measure (profitability vs. market value) used; (3) the effects appear after different delays; (4) CFP does not seem to Granger-cause CSP in most of the model specifications.

CSR strengths and concerns are often summed and used as a composite measure of CSP. This approach has been criticized in the literature, and as our findings imply, with reason. Our results show that the strengths and concerns have different influences on financial performance, and especially on profitability. With respect to profitability, changes in CSR strengths do not seem to play any role, unlike changes in concerns that seem to impact negatively. This is implied by the statistically significant negative coefficients of the lagged changes in CSR concerns, not by Granger causality which cannot be used to make such inferences. Instead, changes in both strengths and concerns turned out to Granger-cause changes in market value. It seems clear that strengths and concerns should not be combined in empirical settings. The effects of changes in CSR strengths on market value appear after shorter lags (starting with one year) than the effects of changes in concerns (starting with a four-year lag). This may indicate that, compared to positive CSR news, it takes longer for information on concerns to reach the market. It is naturally in the interest of a company to bring out its CSR advances, whereas information on concerns diffuses more slowly. Lastly, CFP did not seem to Granger-cause CSP in most of the model specifications. Thus, the results of this study do not lend support to the "virtuous circle" hypothesis of bidirectional causality between CSP and CFP.

We summarize the main contributions of the study as follows. To our knowledge, it is the first one to apply the Granger causality test to panel data in the context of the energy industry. It is therefore a valuable addition to the CSR discussion in the energy sector, where sustainability issues are of vital importance. In addition, it contributes more generally to the CSR literature in demonstrating that CSR strengths and concerns should be treated as distinct constructs in empirical settings. Further, our results do not support the existence of bidirectional causality between CSP and CFP, unlike the findings of some previous studies. Nevertheless, they are in line with the findings of Agarwal and Berens [13], who applied relatively similar methodology. Our methodological choices and the context of this study may explain the difference in results in comparison to those of Waddock and Graves [32], for example. We kept CSR strengths and concerns separate, and used a longer time series than in most of the earlier studies. Even if the longer time dimension allowed us to include a larger number of lags in the equations, it may be that the relationship between CSP and CFP changed over time, which Granger causality is not able to capture. It is also possible that the relation appears weaker when panel Granger testing is used. Further, our single focus on the

energy sector may have affected the results because the sector has been a forerunner in implementing CSR practices, the implication being that a certain level of CSP has become an industry standard and therefore has no impact on profitability.

The results of this study cannot be generalized directly to other industries. It would therefore be interesting to conduct a similar study in other industrial settings, such as those that are closer to end-users and more consumer-driven. Moreover, the Granger causality tests performed here apply to the totals of CSR strengths and concerns. Analyzing the CSP-CFP link separately for different CSP dimensions (such as community and environment) could thus shed further light on the exact nature of the relationship.

Our study has again highlighted the importance of CSR for business organizations. The finding that CSP seems to affect market value indicates that attending to stakeholder relationships may increase shareholder value.

Acknowledgements

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Appendix A

See Tables A.1–A.7.

Table A.1
Summary statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
CSR strengths	266	2.13	1.82	0	10
CSR concerns	266	3.91	3.55	0	15
ROA	266	6.04	3.78	−4.55	23.04
Market capitalization	266	1.54E+10	2.51E+10	1.83E+08	1.97E+11
Net sales	266	1.36E+10	3.04E+10	1.90E+08	2.55E+11
Change in CSR strengths	252	0.11	0.85	−2	3
Change in CSR concerns	252	0.30	1.21	−5	4
Change in ROA	252	−0.04	3.56	−13.78	12.78
Change in log of market capitalization	252	0.11	0.33	−2.24	1.40
Log of net sales	266	22.35	1.45	19.06	26.26

Table A.2
Correlations.

Variable	CSR strengths	CSR concerns	ROA	Market capitalization	Net sales
CSR strengths	1				
CSR concerns	0.5229	1			
ROA	0.1678	0.1484	1		
Market capitalization	0.7002	0.6569	0.3247	1	
Net sales	0.6824	0.6001	0.2762	0.9287	1

Table A.3
Panel unit root test results (14 energy-sector companies, 1991–2009).

Panel unit-root tests		Change in CSR strengths		Change in CSR concerns		Change in return on assets		Change in market capitalization	
		Stat.	Prob.	Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
Levin, Lin and Chu Adjusted t*	No trend	−11.99	0.0000	−14.65	0.0000	−13.19	0.0000	−17.29	0.0000
	Trend	−8.93	0.0000	−8.79	0.0000	−9.27	0.0000	−15.15	0.0000
Im, Pesaran and Shin W-stat	No trend	−10.23	0.0000	−12.92	0.0000	−12.61	0.0000	−15.47	0.0000
	Trend	−6.78	0.0000	−9.33	0.0000	−9.09	0.0000	−13.17	0.0000
Fisher-type unit-root test	No trend	123.72	0.0000	119.08	0.0000	175.37	0.0000	178.33	0.0000
(based on augmented Dickey-Fuller)	Trend	85.79	0.0000	102.11	0.0000	123.07	0.0000	125.48	0.0000
Fisher-type unit-root test	No trend	311.33	0.0000	294.46	0.0000	323.53	0.0000	416.61	0.0000
(based on Phillips-Perron)	Trend	252.18	0.0000	249.39	0.0000	252.86	0.0000	338.18	0.0000

Notes: Null hypothesis: (all) panels contain unit roots.
Number of lags included in the test equation:

1. Change in CSR strengths: LLC & IPS: 0.86 (no trend) and 1.14 (trend) lags average (chosen by BIC), ADF & PP: 1 lag.
2. Change in CSR concerns: LLC & IPS: 0.50 (no trend) and 1.29 (trend) lags average (chosen by BIC), ADF & PP: 1 lag.
3. Change in Return on Assets: LLC & IPS: 0.50 (no trend) and 0.86 (trend) lags average (chosen by BIC), ADF & PP: 1 lag.
4. Change in Return on Invested Capital: LLC & IPS: 0.57 (no trend) and 0.86 (trend) lags average (chosen by BIC), ADF & PP: 1 lag.
5. Change in Market Capitalization: LLC & IPS: 0.43 (no trend and trend) lags average (chosen by BIC), ADF & PP: 1 lag.

Table A.4
Granger causality analysis using GLS: Dependent variables CSR strengths (Panel A) and CSR concerns (Panel B).

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: change in CSR strengths as the dependent variable						
CSR strengths (L1)	−0.225***	−0.217***	−0.206***	−0.244***	−0.165**	−0.186**
	(−3.62)	(−3.28)	(−3.11)	(−3.49)	(−2.28)	(−2.55)
CSR strengths (L2)		−0.068	−0.053	−0.038	−0.009	−0.003
		(−1.00)	(−0.77)	(−0.53)	(−0.12)	(−0.04)
CSR strengths (L3)			0.021	0.010	−0.009	0.057
			(0.30)	(0.14)	(−0.12)	(0.72)
CSR strengths (L4)				0.017	0.025	0.035
				(0.22)	(0.32)	(0.45)
CSR strengths (L5)					−0.011	−0.028
					(−0.13)	(−0.34)
CSR strengths (L6)						−0.089
						(−1.02)
ROA (L1)	−0.002	−0.001	−0.007	−0.009	−0.006	−0.004
	(−0.12)	(−0.09)	(−0.40)	(−0.47)	(−0.28)	(−0.17)
ROA (L2)		0.005	−0.002	−0.004	−0.000	−0.005
		(0.30)	(−0.11)	(−0.20)	(−0.02)	(−0.23)
ROA (L3)			−0.019	−0.019	−0.021	−0.015
			(−1.04)	(−0.93)	(−0.89)	(−0.62)
ROA (L4)				−0.007	−0.008	0.000
				(−0.35)	(−0.36)	(0.02)
ROA (L5)					−0.010	0.005
					(−0.46)	(0.23)
ROA (L6)						0.029
						(1.37)
Constant	0.123**	0.133**	0.118*	0.121*	0.110	0.116
	(2.19)	(2.23)	(1.94)	(1.78)	(1.55)	(1.55)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	0.01	0.12	1.18	1.01	1.07	2.88
Panel B: change in CSR concerns as the dependent variable						
	(1)	(2)	(3)	(4)	(5)	(6)
CSR concerns (L1)	−0.108*	−0.160**	−0.161**	−0.159**	−0.263***	−0.243***
	(−1.69)	(−2.40)	(−2.39)	(−2.28)	(−3.69)	(−3.17)
CSR concerns (L2)		−0.074	−0.082	−0.076	−0.108	−0.091
		(−1.10)	(−1.19)	(−1.08)	(−1.48)	(−1.19)
CSR concerns (L3)			−0.136*	−0.139*	−0.160**	−0.133*
			(−1.96)	(−1.93)	(−2.21)	(−1.75)
CSR concerns (L4)				−0.124*	−0.159**	−0.165**
				(−1.67)	(−2.05)	(−2.08)
CSR concerns (L5)					−0.155*	−0.158*
					(−1.95)	(−1.86)
CSR concerns (L6)						0.036
						(0.39)
ROA (L1)	0.017	0.021	0.021	0.014	−0.009	−0.015
	(0.75)	(0.85)	(0.81)	(0.51)	(−0.30)	(−0.45)
ROA (L2)		0.015	0.012	0.010	−0.015	−0.018
		(0.62)	(0.44)	(0.33)	(−0.49)	(−0.54)
ROA (L3)			−0.003	−0.015	−0.052	−0.051
			(−0.12)	(−0.50)	(−1.52)	(−1.43)
ROA (L4)				−0.002	−0.045	−0.043
				(−0.07)	(−1.37)	(−1.17)
ROA (L5)					−0.054*	−0.044
					(−1.85)	(−1.26)
ROA (L6)						0.016
						(0.53)
Constant	0.325***	0.352***	0.406***	0.482***	0.703***	0.683***
	(4.07)	(3.93)	(4.19)	(4.56)	(5.75)	(4.78)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	0.56	0.88	0.92	1.06	4.36	4.70

Notes: t statistics in parentheses.
All variables are in first differences. The number of lags is depicted after the variable in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table A.5
Granger causality analysis using GLS: dependent variable ROA.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: change in ROA as the dependent variable						
ROA (L1)	−0.220***	−0.288***	−0.322***	−0.445***	−0.264***	−0.202**
	(−3.28)	(−4.26)	(−4.35)	(−5.97)	(−3.46)	(−2.43)
ROA (L2)		−0.314***	−0.365***	−0.484***	−0.419***	−0.439***
		(−4.61)	(−4.94)	(−5.86)	(−5.15)	(−5.31)
ROA (L3)			−0.153**	−0.246***	−0.136	−0.184**
			(−2.06)	(−2.97)	(−1.53)	(−2.01)
ROA (L4)				−0.136*	−0.081	−0.213**
				(−1.77)	(−0.96)	(−2.26)
ROA (L5)					−0.001	−0.158*
					(−0.01)	(−1.77)
ROA (L6)						−0.254***
						(−3.16)
CSR strengths (L1)	−0.115	−0.229	−0.166	−0.113	−0.101	−0.132
	(−0.43)	(−0.87)	(−0.61)	(−0.41)	(−0.37)	(−0.47)
CSR strengths (L2)		−0.502*	−0.478*	−0.341	−0.323	−0.370
		(−1.85)	(−1.69)	(−1.18)	(−1.12)	(−1.27)
CSR strengths (L3)			0.323	0.137	0.138	0.114
			(1.13)	(0.46)	(0.49)	(0.38)
CSR strengths (L4)				−0.215	−0.109	−0.133
				(−0.73)	(−0.37)	(−0.45)
CSR strengths (L5)					0.456	0.381
					(1.49)	(1.20)
CSR strengths (L6)						0.001
						(0.00)
Constant	0.060	0.218	0.257	0.406	0.164	0.380
	(0.27)	(0.98)	(1.08)	(1.47)	(0.62)	(1.36)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	0.19	3.73	4.99	2.72	4.25	3.97
Panel B: change in ROA as the dependent variable						
	(1)	(2)	(3)	(4)	(5)	(6)
ROA (L1)	−0.231***	−0.322***	−0.395***	−0.537***	−0.289***	−0.208**
	(−3.44)	(−4.71)	(−5.35)	(−7.41)	(−3.83)	(−2.58)
ROA (L2)		−0.317***	−0.397***	−0.533***	−0.425***	−0.441***
		(−4.61)	(−5.24)	(−6.47)	(−5.31)	(−5.43)
ROA (L3)			−0.172**	−0.306***	−0.180**	−0.224**
			(−2.31)	(−3.67)	(−2.08)	(−2.54)
ROA (L4)				−0.174**	−0.087	−0.229**
				(−2.32)	(−1.05)	(−2.49)
ROA (L5)					0.028	−0.141
					(0.36)	(−1.63)
ROA (L6)						−0.266***
						(−3.41)
CSR concerns (L1)	−0.271	−0.242	−0.264	−0.304	−0.170	−0.331*
	(−1.47)	(−1.31)	(−1.40)	(−1.64)	(−0.92)	(−1.72)
CSR concerns (L2)		0.035	−0.002	−0.022	0.096	0.043
		(0.19)	(−0.01)	(−0.12)	(0.51)	(0.23)
CSR concerns (L3)			−0.266	−0.326*	−0.373**	−0.368*
			(−1.37)	(−1.66)	(−1.99)	(−1.92)
CSR concerns (L4)				−0.509***	−0.425**	−0.414**
				(−2.58)	(−2.14)	(−2.09)
CSR concerns (L5)					0.389*	0.419**
					(1.89)	(1.97)
CSR concerns (L6)						0.033
Constant	0.133	0.196	0.394	0.740**	0.348	0.619*
	(0.59)	(0.81)	(1.45)	(2.30)	(1.13)	(1.77)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	2.15	1.85	3.75	9.81**	14.64**	17.01***

Notes: t statistics in parentheses.
All variables are in first differences. The number of lags is depicted after the variable in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table A.6
Granger causality analysis using GLS: dependent variables CSR strengths (Panel A) and CSR concerns (Panel B).

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: change in CSR strengths as the dependent variable						
CSR strengths (L1)	−0.228***	−0.216***	−0.205***	−0.252***	−0.170**	−0.189**
	(−3.67)	(−3.28)	(−3.10)	(−3.60)	(−2.34)	(−2.57)
CSR strengths (L2)		−0.059	−0.041	−0.023	0.011	0.006
		(−0.85)	(−0.58)	(−0.31)	(0.14)	(0.07)
CSR strengths (L3)			0.032	0.025	0.000	0.056
			(0.45)	(0.33)	(0.00)	(0.70)
CSR strengths (L4)				0.019	0.024	0.041
				(0.25)	(0.31)	(0.52)
CSR strengths (L5)					−0.013	−0.040
					(−0.17)	(−0.48)
CSR strengths (L6)						−0.099
						(−1.13)
Market capitalization (L1)	0.113	0.112	0.112	0.143	0.154	0.081
	(0.69)	(0.64)	(0.63)	(0.78)	(0.81)	(0.42)
Market capitalization (L2)		0.153	0.179	0.204	0.181	0.143
		(0.81)	(0.91)	(0.99)	(0.86)	(0.68)
Market capitalization (L3)			0.008	0.028	−0.005	−0.027
			(0.04)	(0.14)	(−0.02)	(−0.12)
Market capitalization (L4)				−0.090	−0.110	−0.195
				(−0.46)	(−0.52)	(−0.89)
Market capitalization (L5)					0.026	−0.111
					(0.13)	(−0.51)
Market capitalization (L6)						−0.208
						(−1.00)
Constant	0.112*	0.101	0.073	0.073	0.065	0.144
	(1.92)	(1.47)	(0.96)	(0.80)	(0.64)	(1.27)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	0.48	0.86	1.04	1.63	1.66	2.43
Panel B: change in CSR concerns as the dependent variable						
	(1)	(2)	(3)	(4)	(5)	(6)
CSR concerns (L1)	−0.111*	−0.147**	−0.159**	−0.149**	−0.224***	−0.211***
	(−1.76)	(−2.21)	(−2.36)	(−2.13)	(−3.15)	(−2.75)
CSR concerns (L2)		−0.083	−0.083	−0.076	−0.095	−0.072
		(−1.25)	(−1.21)	(−1.10)	(−1.32)	(−0.96)
CSR concerns (L3)			−0.132*	−0.145**	−0.173**	−0.149**
			(−1.93)	(−2.04)	(−2.41)	(−1.98)
CSR concerns (L4)				−0.133*	−0.118	−0.122
				(−1.80)	(−1.53)	(−1.53)
CSR concerns (L5)					−0.124	−0.123
					(−1.57)	(−1.45)
CSR concerns (L6)						0.033
						(0.35)
Market capitalization (L1)	−0.345	−0.304	−0.290	−0.396	−0.223	−0.219
	(−1.46)	(−1.22)	(−1.14)	(−1.52)	(−0.83)	(−0.78)
Market capitalization (L2)		0.182	0.180	0.130	−0.091	−0.094
		(0.66)	(0.63)	(0.45)	(−0.31)	(−0.31)
Market capitalization (L3)			0.192	0.060	0.192	0.187
			(0.68)	(0.21)	(0.63)	(0.59)
Market capitalization (L4)				−0.302	−0.266	−0.218
				(−1.05)	(−0.91)	(−0.71)
Market capitalization (L5)					0.555*	0.614**
					(1.88)	(1.97)
Market capitalization (L6)						0.139
						(0.45)
Constant	0.365***	0.367***	0.393***	0.543***	0.610***	0.553***
	(4.40)	(3.61)	(3.32)	(3.99)	(3.82)	(2.94)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	2.12	2.49	2.82	4.85	7.47	7.44

Notes: t statistics in parentheses.
All variables are in first differences. The number of lags is depicted after the variable in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table A.7
Granger causality analysis using GLS: Dependent variable market capitalization.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: change in market capitalization as the dependent variable						
Market capitalization(L1)	−0.186***	−0.254***	−0.247***	−0.233***	−0.269***	−0.308***
	(−2.97)	(−3.87)	(−3.61)	(−3.29)	(−3.67)	(−4.05)
Market capitalization(L2)		−0.174**	−0.183**	−0.218***	−0.239***	−0.266***
		(−2.46)	(−2.45)	(−2.81)	(−2.96)	(−3.17)
Market capitalization(L3)			−0.005	−0.024	−0.075	−0.062
			(−0.07)	(−0.30)	(−0.90)	(−0.72)
Market capitalization(L4)				−0.125*	−0.178**	−0.208**
				(−1.65)	(−2.21)	(−2.40)
Market capitalization(L5)					−0.113	−0.116
					(−1.42)	(−1.34)
Market capitalization(L6)						−0.009
						(−0.11)
CSR strengths(L1)	−0.079***	−0.083***	−0.086***	−0.088***	−0.091***	−0.092***
	(−3.32)	(−3.35)	(−3.38)	(−3.24)	(−3.27)	(−3.16)
CSR strengths(L2)		−0.002	0.003	0.015	0.024	0.024
		(−0.07)	(0.11)	(0.53)	(0.80)	(0.76)
CSR strengths(L3)			−0.009	−0.012	−0.005	−0.015
			(−0.35)	(−0.41)	(−0.16)	(−0.48)
CSR strengths(L4)				0.020	0.010	0.016
				(0.68)	(0.32)	(0.52)
CSR strengths(L5)					−0.039	−0.053
					(−1.24)	(−1.58)
CSR strengths(L6)						0.004
						(0.10)
Constant	0.137***	0.161***	0.175***	0.187***	0.226***	0.226***
	(6.73)	(6.57)	(6.13)	(5.65)	(5.92)	(5.03)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	11.05***	11.52***	11.97***	12.12**	14.38**	15.69**
Panel B: change in market capitalization as the dependent variable						
	(1)	(2)	(3)	(4)	(5)	(6)
Market capitalization(L1)	−0.194***	−0.269***	−0.282***	−0.269***	−0.244***	−0.273***
	(−3.02)	(−4.09)	(−4.13)	(−3.86)	(−3.34)	(−3.58)
Market capitalization(L2)		−0.185**	−0.198***	−0.232***	−0.261***	−0.287***
		(−2.53)	(−2.61)	(−2.99)	(−3.25)	(−3.45)
Market capitalization(L3)			−0.019	−0.038	−0.069	−0.059
			(−0.25)	(−0.48)	(−0.85)	(−0.69)
Market capitalization(L4)				−0.135*	−0.171**	−0.199**
				(−1.76)	(−2.15)	(−2.35)
Market capitalization(L5)					−0.059	−0.068
					(−0.73)	(−0.80)
Market capitalization(L6)						−0.059
						(−0.69)
CSR concerns(L1)	0.001	−0.002	−0.006	−0.000	−0.008	0.001
	(0.09)	(−0.13)	(−0.31)	(−0.00)	(−0.42)	(0.04)
CSR concerns(L2)		0.004	0.000	0.007	−0.002	0.003
		(0.22)	(0.02)	(0.36)	(−0.08)	(0.13)
CSR concerns(L3)			−0.023	−0.021	−0.029	−0.021
			(−1.26)	(−1.12)	(−1.51)	(−1.01)
CSR concerns(L4)				0.055***	0.045**	0.048**
				(2.76)	(2.15)	(2.22)
CSR concerns(L5)					−0.051**	−0.048**
					(−2.33)	(−2.08)
CSR concerns(L6)						0.038
						(1.53)
Constant	0.128***	0.155***	0.181***	0.178***	0.221***	0.204***
	(6.00)	(5.93)	(5.85)	(4.90)	(5.28)	(3.99)
Observations	238	224	210	196	182	168
Number of groups	14	14	14	14	14	14
Granger test:						
chi2-statistic	0.01	0.07	1.67	10.14**	14.18**	15.98**

Notes: t statistics in parentheses.
All variables are in first differences. The number of lags is depicted after the variable in parentheses.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Appendix B

See Table B.1.

Table B.1
Description of the sample companies.

Company name	Net sales in 2009 (million USD)	Description
Hess Corporation	29,378.0	Global integrated energy company that operates exploration and production and marketing and refining. The main activities in exploration and production cover developing, producing, purchasing, transporting and selling crude oil and natural gas. These activities locate in Algeria, Australia, Azerbaijan, Brazil, Brunei, China, Denmark, Egypt, Equatorial Guinea, France, Ghana, Indonesia, the Kurdistan region of Iraq, Libya, Malaysia, Norway, Peru, Russia, Thailand, the United Kingdom and the United States. The marketing and refining segment includes manufacturing of refined petroleum products and purchasing, marketing and trading refined petroleum products, natural gas and electricity.
American Electric Power Company, Inc.	13,489.0	A utility holding company whose subsidiaries' service areas cover portions of the states in USA.
Anadarko Petroleum Corporation	8249.0	An exploration and production company that has three segments: oil and gas exploration and production, midstream, and marketing. It has production and exploration activities globally, including positions located in East and West Africa, Algeria, China, Alaska, and New Zealand.
Apache Corporation	8612.7	The company explores for, develops, and produces natural gas, crude oil, and natural gas liquids in the United States, Canada, Egypt, Australia, the United Kingdom in the North Sea, and Argentina.
Chevron Corporation	159,387.0	Company whose subsidiaries are engaged in integrated petroleum operations, chemicals operations, mining activities, power generation and energy services. Upstream operations consist primarily of exploring for, developing and producing crude oil and natural gas. Downstream operations consist primarily of refining crude oil into petroleum products and transporting crude oil and refined products.
Dominion Resources, Inc.	15,131.0	The company is a producer and transporter of energy. The company is a provider of electricity, natural gas and related services to customers primarily in the eastern region of the United States. It also operates one of the underground natural gas storage systems.
Energen Corporation	1440.4	A diversified energy holding company engaged in the development, acquisition, exploration and production of oil and gas in the continental United States and in the purchase, distribution and sale of natural gas in central and north Alabama.
Entergy Corporation	10,423.7	An integrated energy company engaged primarily in electric power production and retail distribution operations.
EQT Corporation	1167.9	The company operates in three business segments: production (a natural gas producer); midstream (provides gathering, transmission and storage services); and distribution (e.g. distributes and sells natural gas to residential, commercial and industrial customers).
Occidental Petroleum Corporation	15,369.0	The company operates in three segments: oil and gas segment (explores for, develops and produces oil and gas); chemical segment (principally manufactures and markets basic chemicals and vinyls); and midstream, marketing and other segment (e.g. gathers, processes, transports, stores, purchases and markets oil and gas).
Public Service Enterprise Group, Incorporated	11,738.0	The company operates through three subsidiaries: PSEG Power LLC (Power integrates its generating asset operations with its wholesale energy sales, fuel supply and energy trading functions); Public Service Electric and Gas Company (PSE&G is a public utility); and PSEG Energy Holdings L.L.C.
Southern Company	15,738.0	The primary business of the company is electricity sales by the traditional operating companies and Southern Power. The four traditional operating companies are vertically integrated utilities providing electric service in four Southeastern states. Southern Power constructs, acquires, owns, and manages generation assets.
The Williams Companies, Inc.	8255.0	An energy infrastructure company that connects North America's hydrocarbon resource plays to markets for natural gas, natural gas liquids (NGLs), and olefins. Its operations spans from the deepwater Gulf of Mexico to the Canadian oil sands.
Helmerich & Payne, Inc.	1894.0	The company is involved in contract drilling of oil and gases wells for other companies. It has three reportable business segments: U.S. Land, Offshore and International Land. Has drilling operations in several states in the United States, and offshore operations in the Gulf of Mexico, California, Trinidad and Equatorial Guinea. International Land segment operated in Ecuador, Colombia, Argentina, Tunisia, Bahrain and United Arab Emirates. It is also engaged in the ownership, development and operation of commercial real estate and the research and development of rotary steerable technology.

The turnover information is based on the Thomson ONE database. The company descriptions are modified from business descriptions provided by Thomson ONE.

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